#358: Eavesdropping on the classroom: How new insights into student interactions can lead to better teaching

VOICEOVER

This is Up Close, the research talk show from the University of Melbourne, Australia.

[Music]

ELISABETH LOPEZ

Hi. I'm Elisabeth Lopez. Thanks for joining us. Cameras, microphones, an observation room - we could be talking about an interrogation suite or reality TV show, but this is actually the set up of a pioneering lab that is examining how social interaction affects student performance in maths and science.

In most countries policymakers are concerned about how their citizens perform in the so-called STEM disciplines: science, technology, engineering and maths. They're recognised as the building blocks of innovation and global economic competitiveness, and building these capabilities goes right back to the earliest years of school.

It's not surprising then that governments look to countries that do well in international test results for clues as to what works in maths and science education. But what do we really know about teaching and learning and what works? Are there universal approaches that help school children excel in maths and science?

Our guest on Up Close is Director of a unique research centre that uses audiovisual technology to dissect what goes on in the classroom. Professor David Clarke is Director of the International Centre for Classroom Research at the University of Melbourne.
David, welcome to Up Close.

DAVID CLARKE

Thank you very much.

ELISABETH LOPEZ

So the Science of Learning classroom clearly takes a very granular view of what happens in classrooms. What does the Science of Learning classroom look like?

DAVID CLARKE

Our intention was that when you walk in it should look, to all intents and purposes, like a conventional classroom. And, to some extent, it does. There'll be things that you will notice if you're extremely observant. You'll notice some little hemispherical hubs that are, in fact, the remotely controlled rotating cameras, but they are difficult to see.

You'll notice some dangling objects from the roof, which are the built in microphones. You may also notice what appears to be an extremely large mirror down one end of the room which is, of course, a one way window.

The other side of that mirror is a control room in which, most frequently, I and a couple of my research assistants, plus our two technicians, will be sitting and observing and recording the classroom, but the students cannot help but be aware that there is a very large - what appears to be a mirror along one wall, and they have no trouble anticipating what's going on behind that.

Now, the students have come in from their school environment to sit in this classroom, and so there is no denying that it's an experimental environment. But, on the other hand, they don't necessarily look around the classroom and find themselves confronted by several large technical people standing behind tripods. It's a compromise, but we feel it's a very successful compromise, in part because we can have up to 16 cameras.

ELISABETH LOPEZ

How long does it take for them to just become oblivious to it, if ever?

DAVID CLARKE
I would probably argue that 90 per cent of the students are totally oblivious to that 90 per cent of the time. That's partly dependant on the expertise of the teacher and the quality of the tasks. This is also true when we're doing filming in authentic classrooms out in the field.

It's amazing the extent to which students become oblivious to the presence of four tripods in their classroom, simply because they have a good teacher and they have intriguing tasks that are engaging them actively in their learning. They're far more interested in participating in a well taught class and a well taught lesson, doing interesting activities, than they are in peering over their shoulder to see if somebody can vaguely be discerned through a large sheet of glass. So it is wholly dependant and, I would say, significantly overcome, through the effectiveness of the instruction.

ELISABETH LOPEZ

Sixteen cameras, and you have devices, I understand, that monitors what they do on their own digital devices. Is that right?

DAVID CLARKE

We can also simultaneously monitor what they're doing on iPads. We can record up to 32 audio tracks. Now, what this means is that whereas going out to, quote, unquote, the authentic classroom, we had to make selections in advance: which students are we going to focus on? They may or may not be the students who are doing those things most relevant to our research.

In this case we can go in completely cold, document every single student for the duration of the entire activity, every word they say. We can record every action they engage in and, at the end, we can then reverse engineer the whole thing and say, now, which of those students, in collaboration or individually, produced the most sophisticated mathematical performance.

If we backtrack - using the video, using the audio record, looking at their written products - can we find a reason why that pair of students, or that group of students, were so productive, why their mathematical problem solving was so effective and, hopefully, generate a set of principles that we could then communicate to teachers to inform their practice: how might we afford those sorts of interactions.

ELISABETH LOPEZ

What is the brief from the centre when you get a cohort of students and a teacher coming in? Are they told to do anything differently?

DAVID CLARKE
I meet with the teachers fully a week before we actually do the filming. I share with them our initial draft design for the session that they're going to be delivering with their kids. That's a negotiated agreement. Those tasks that we design for them have been deliberately constructed to afford certain responses. This is the craft. These are the tools of our trade.

ELISABETH LOPEZ

What might a draft design look like?

DAVID CLARKE

This entire year we've been focusing specifically on the social unit of instruction. So a group of children walk into the classroom, and the first activity they engage in, they do so as individuals. The next activity, those individuals work as pairs. Then the pairs become a quartet, and the quartets attempt a fairly complex mathematical task. But the individual activity has been designed to give us a base line reading of the mathematical competence of each child.

The pair activity has been designed to encourage the students to explore particular solution possibilities that will alert them to the affordances of the task. In some cases I'm quite mischievous about this because I will deliberately offer the pairs the type of tasks that will lead them to a solution approach that is, perhaps, intention with the solution approach that the other pair might have been encouraged to adopt. Now, the reason for that is we're intensely interested in negotiation. There is a widespread belief that the facilitation of student negotiation is a critical aspect of developing sophisticated understandings in both mathematics and science.

So without that capacity to create these complex interactions, we're not able to study them. So we've crafted the conditions for their occurrence in a way that maximises the opportunity for students to engage in those sorts of negotiations gives us the data that we need.

ELISABETH LOPEZ

Is there still a mindset among teachers that student negotiation is just really unhelpful chatter that's not really related to the task at hand?

DAVID CLARKE

Interesting question because I think there is a shared rhetoric that teachers subscribe to, at least publicly across Australia, where student talk is a good thing. This is different from some of the other cultures, some of the other countries, with
which we do international research. Having said that, the nature of that student talk and its purpose is much less understood. One of the things that we'd like to be able to do is to say if we have, in fact, a teaching community that has now the appearance of subscription to the notion that student talk is a good thing, what guidance can we give them about the appropriate, most effective forms that that student talk might take and what actions they could engage in that would best facilitate productive student talk.

ELISABETH LOPEZ

David, where do children get their negotiation styles from?

DAVID CLARKE

It's absorbed from the environment in which they find themselves. Now, if you think of conversation in the sense of dialogue - in particular the notion of putting forward a hypothesis and having it refuted by a peer - this is most unlikely to occur in particular cultural environments. In particular, the idea that a teacher might put forward a proposal that would be questioned or challenged by a student is extremely rare in certain communities.

Now, our students are much less reticent to challenge each other's ideas, and we would see that as a good thing. Many of our colleagues in countries overseas - like Singapore, China, Korea - would, in fact, within reason, value a greater willingness on the part of the students to, in a structured way, refute the arguments of another person. But, culturally, there are not many opportunities for them either to see that done by others or to rehearse doing it themselves.

ELISABETH LOPEZ

So if I've got this straight, students in western countries like Australia are more prepared to challenge a teacher, but less prepared to challenge each other.

DAVID CLARKE

Oh, no, no, no. They'll challenge each other as well. They have social models in which there is nothing particularly wrong with contesting another person's opinion. They don't have to consider issues of status, seniority, age. None of these things are necessarily a constraint. Now, this is hugely advantageous for us. I think sometimes we don't realise the affordances of our classrooms. There are things that are available to our teachers that facilitate the type of sophisticated argumentation that we're trying to develop.
Now, that sort of sophisticated argumentation is valued explicitly in the curricula of almost every country in the world, but we're singularly advantaged in the extent to which we're able to realise it. Forms of reasoning, the use of a counter example, hypothesis formulation and refutation find their way into curriculum documents in Finland. They find their way into curriculum documents in China and in Australia. Teachers’ capacity to purposefully encourage and develop those skills are much less consistently realised and significantly constrained by the cultural norms that apply in each of those classrooms.

ELISABETH LOPEZ

What do teachers get from participating in one of your research projects because of the technology that's available to review what happens in the classroom - because, let's face it, classrooms are really busy places. You've got collisions of learning styles, personalities. The teacher can't hear every conversation that's happening at the same time, and they're focussed on delivering their lesson as well. So what do they get out of this?

DAVID CLARKE

It depends on the nature of the study they're participating in. I must admit I have apologised to teachers for some of my research designs because I have purposefully written them out. That is, their role has been to create the conditions for student collaborative problem solving, but then to, as it were, step back, because I don't want the quality of the student dialogue in some way contaminated by a teacher intrusion. On the other hand, we've also been studying what contribution does the teacher make by way of facilitating those interactions. That's a different study. Now, in those cases where the teacher has written into the study, we add an additional element to our data collection. We use a thing called post-lesson video-stimulated interviews. The teacher sits down with us - and this is a great joy for us - and the teachers consistently - without question, every teacher appreciates the opportunity to sit down with somebody else, look at a video tape of them teaching, where...

ELISABETH LOPEZ

I thought that would half the teachers fleeing and screaming from the room.

DAVID CLARKE

You would think, but the vast majority of teachers, at the end of a filming sequence, will say I am going to miss this so much because I never get the chance both to look at myself teaching and to talk with somebody else about what I think are the significant moments in the lesson and how I responded well or less well to them.
The teachers tell me afterwards I was so interested in the students’ response to that particular activity, or that particular grouping structure, that I’ve gone back to my school and tried it out with four other classes.

ELISABETH LOPEZ

Tell me, what are some of the characteristics of a really important moment that might take place?

DAVID CLARKE

A good example would be, for instance, where the student posed a question that expanded the conception of the task, took it in a direction of generality that the teacher hadn’t anticipated. If we take a very simple question like - for instance, to a Grade 5 class I might pose the question: the average of five numbers is 24. What might the numbers be?

You might expect with a Grade 5 class that you would get some single answers, some sets of numbers, multiple sets of numbers. But the point at which one student says, but isn’t it simply any five numbers that add up to 120 - and the rest of the class - and sometimes the teacher - look quite caught off guard because here is a beautifully framed generality that offers the possibility to say, wow, is mathematics actually about not just the listing of possible answers, but the framing of a general rule that describes all possible answers to that question? That sort of thing might be an example of the sort of thing we’re talking about.

ELISABETH LOPEZ

I suppose it goes to the heart of teachers’ ability to recall what the steps are in solving a particular problem, because if they’ve been numerate for a long time they might just be used to spewing out the answer, but the concepts that they have to employ have become almost unconscious now.

DAVID CLARKE

In particular, the teachers can be too narrowly focussed on the algorithm. They can have in their own mind what constitutes the expected solution. And a student who comes up with a novel approach isn’t always appreciated. One of the great joys of the international research that we’ve been doing is being able to eavesdrop on the practices of very competent teachers in other places.

One of my favourite excerpts was actually in a classroom in Shanghai, where one of the students offered a particular solution to a problem, and the teacher looked
momentary startled and then said, everyone, Xu Yin's solution method is much better than the one in the text book. Would everyone copy it down? I think we will use this from now on.

Now, the teacher's flexibility in, first of all, recognising the mathematical legitimacy of the student's solution, and then recognising that its elegance was something worth supporting, this was a remarkable thing.

ELISABETH LOPEZ

I guess this is not for the faint hearted maths teachers who might have specialised in other disciplines and have been reluctantly drawn into maths teaching, given the shortage of maths teachers in many school systems.

DAVID CLARKE

You raise a particularly important issue here. We have the phrase out-of-field teaching. There is a sense in which every primary school teacher is teaching out-of-field most of the time. Once we take on that perspective, then we can ask ourselves the question are there, in fact, generic pedagogical principles, instructional practices that, in fact, provide points of reference for a teacher, no matter what they're teaching. I think the answer is quite frequently yes.

So a good teacher with a background in history may not immediately see the relevance of their historical expertise. But if they think of it in terms of framing hypotheses that explain particular historical phenomenon and the argumentative exchange by which you might say, but what's the evidence to contest that? That logical exchange has a fundamental place in the mathematics classroom, and the mathematics content, to some extent, is simply the vehicle by which students explore modes of critical thought, modes of inquiry, which are really the focus of contemporary curricula reform.

ELISABETH LOPEZ

Is this approach of inquiry and challenge and testing supported by Government practice where education departments mandate nationwide testing or, in the senior years of secondary school, even international testing?

DAVID CLARKE

We have, without question, a tension between those things which can be readily assessed and those things which we purport to value. Now, this has always been with us. Before we had national tests, before we had international testing, a parent or
a student were fully justified in saying you can tell me that you value sophisticated reasoning, problem solving behaviour, collaborative group work, but I see no evidence of you assessing it, and so why should I take it seriously?

We find that now instantiated and institutionalised at the national and international level. So we are constrained by those things that we can readily measure. There’s a real danger that we will restrict the aspirations of our teaching to only those things that can be measured. The obvious challenge for us is to improve the sophistication of our capacity to measure the things that we value.

A standard line that I would run when I’m talking to a group of teachers is I would hope that we value all the things that we measure, but do we, in fact, measure all the things that we value? So we are becoming better at it. We’re becoming at recognising the performance as constituting the assessable object, rather than simply the written object becoming the assessable object. There’s a sophistication element to that that I think the teaching community is coming to terms with.

One of the jobs I had at one point was the evaluation of some problem based learning curriculum materials in California. We have two sets of schools. We have a set of schools that implemented the problem based learning and we have a set of schools that did conventional instruction. Both sets of schools produced comparable performance on conventional tests.

However, when we interviewed and surveyed the students, the students from the school that had used the problem based learning materials had an image of mathematics as a living endeavour to which they could contribute and which was open to their flexible exploration. The students who had participated in conventional instruction saw mathematics as a set of rules set down many years ago, absolutely unable to be varied, and simply to be memorised as effectively as possible. One of those leads to enthusiastic further participation in a subject, and one probably does not.

ELISABETH LOPEZ

You’re listening to Up Close. I’m Elisabeth Lopez, and our guest is Professor David Clarke, Director of the International Centre for Classroom Research.

David, a major part of the Centre’s brief is comparing different cultures. You have a project that’s looking at Australia, Finland and China. How do you bridge those cultures? How do you make meaningful comparisons when the pedagogical approaches are so different?

DAVID CLARKE

I think this is a really important question. By what measures can you legitimately
judge, evaluate, assess teaching in a Chinese context vis-a-vis teaching in an
Australian context? Now, the most authentic answer you can give to that is by the
local standard. To what extent are the aspirations of the Chinese community being
met by the delivery provided by their teachers? We can make that assessment.

We don’t only do post-lesson interviews with teachers. We do post-lesson interviews
with the children in the study that you’re referring to. After the lesson we would
interview one or two of the children — typically two — and we would show them the
video of the lesson. We would ask them to identify those things in the lesson which
they considered to be significant. Inevitably, we get asked what do you mean by
significant? We say, well, what we mean by significant is whatever you think was
important.

Now, we look for commonality and difference. We were really quite startled by one
particular common feature of these students’ accounts. When asked to identify
critical moments in the lesson, the most frequent occurrence in every country, in
every student’s accounts, was the identification of the opportunity to either explain
their thinking or to listen to a classmate explaining their thinking.

Now, if we talk to our neuroscience colleagues we get a glimmer of an idea about
why the students might be so right in identifying the significance of these moments.
Some of the work on empathy suggests that the nature of our engagement with
someone with whom we identify is different at a cognitive and a neural level in quite
a profound way.

If I perceive you as an extremely more able other — almost as though you’re a walking
textbook — and so you give me text, and I listen to the text and I may remember it. But
if I perceive you as somebody who is similar to myself, I start to anticipate what
you’re going to say next. So my entire cognitive engagement with your explanation is
wholly different. I anticipate what you’re going to say. I may even silently mouth to
myself the next sentence I think you’re going to utter. I finish your sentences for you.
We have this on video.

Our hypothesis is that it is this aspect of empathy and the fact that it’s the nature of
their engagement is entirely different. Students are not neuroscientists. They have no
theory for this, but I would argue they are wholly correct in identifying that as
significant.

ELISABETH LOPEZ

David, how important is the fact that a particular classroom might be monocultural,
as opposed to multicultural?

DAVID CLARKE
Without question, the classrooms in, for instance, the United States and Australia, bring together students whose home backgrounds lead them to attach greater or less significance to the whole educational experience. They may be returning to home environments in which what was learned at school is actually a topic of home discussion. They bring that orientation into the classroom with them. I think this is probably as important as any other aspect, this notion of a home valuing of education. Obviously, there are other issues of language, quite technical issues of recent immigrants who may have more or less difficulty in understanding the discourse of the classroom.

ELISABETH LOPEZ

Do you look at how teachers get over, I guess, fundamental levels of disengagement, which is obviously a problem in adolescence and early university?

DAVID CLARKE

It's certainly a problem. The extent to which it is perceived to be a teacher problem - a problem that the teacher must address - is highly culturally specific. One of the distinctions that's turned up in the literature - and I don't want to be misrepresented here. When I talk about the Asian classroom, there is no Asian classroom. A classroom in Japan does not look like a classroom in China, but there are some shared characteristics of classrooms in those communities.

One of those characteristics is there is an expectation that the student should adapt to the demands of the classroom. The expectation in countries like Germany, Australia and the USA is that the teacher should adapt to the needs of the student. This is...

ELISABETH LOPEZ

Entertain us.

DAVID CLARKE

Well, that's the least charitable way of interpreting it. A competent teacher will adjust their practice in sensitive response to the level of engagement of the students, the extent to which they appear to be understanding the discussion that's occurring, the extent to which the teacher's communication seems to be being comprehended appropriately, and there?ll be a continual process of incremental adjustment in what they do. Now, what they're doing is they may walk into the lesson with an outline in their mind of how the lesson might proceed. But the dictate is their sensitivity to the variation in student response and the extent to which they can adapt their instruction
to meet the perceived needs of the students.

Now, on the other hand, if you belong to a culture where you believe the obligation is on the students to attend to your carefully crafted lesson, then you - based on years of experience - are going to craft a lesson that offers many opportunities for the students to participate, that raises many of the key notions as clearly as your extensive experience allows, but you are not going to deviate necessarily from that carefully crafted lesson purely because two students down the back of the room aren't paying attention.

You are not going to disrupt your delivery or the whole class discussion by saying, you two down the back, we need your attention here. That would be an inappropriate distraction. From that perspective, you will be penalising the rest of the class for the sake of two students who are not meeting their obligations in that setting. Their job is to attend, and to attend actively. You're meeting your obligations by producing this carefully crafted lesson. Now, those two different responses - the dynamic between teacher and student - who has the expectations of each and how are those expectations met - this is so culturally specific.

ELISABETH LOPEZ

I wanted to ask you about group work because you've done some interesting work with Chinese overseas students in Melbourne. Group work is starting to enter the Chinese curriculum in recognition of the fact that many Chinese will proceed to study at western universities. It seems a bit strange, in hindsight, that such a collectivist culture as China is quite new to group work. What things have you found in the way students carry it out?

DAVID CLARKE

Group work as a pedagogical strategy is a novelty in the Chinese system at the moment. Group work as a social phenomenon is not. What we found, looking at both group work in class, but also group work out of class, is that the well known phenomenon in Australian universities of Chinese educated students forming study groups outside the lecture context or the tutorial context replicates precisely what happens in China. The system anticipates and even facilitates the creation of these study groups back in China. So much of the students' work is done collaboratively. It's done collectively. It's entirely culturally consistent with the notion of a collectivist culture. It's just interesting that it hasn't found its way into the formal instructional pedagogy which is still probably constrained by two key factors. One is the size of the classes. We are talking about 45 students to a conventional, say, secondary class. We're also talking about a community in which there simply isn't a tradition of student-to-student exchange in classrooms; certainly not of the questioning of the teacher by the students.
Now, when I talk to Australian teachers and I say, okay, let's assume that we're all competent in our teaching. I want you to envisage a classroom in which you have a couple of constraints. One of the constraints is you have 45 students. Another constraint is that none of those students will ever ask you a question. A third constraint is nor will they ever talk to each other. Now I'd like you to go ahead and teach a good lesson.

To a significant extent I've just deskilled the Australian teacher of the key elements that go to make up our pedagogy. Class size is significant. One of our Australian teachers made the statement, I take it as my primary objective in every lesson that I will have a conversation, one-on-one, with every student during the lesson.

ELISABETH LOPEZ

They'll move around the room rather than just be at the front.

DAVID CLARKE

They move around the room. The Japanese call this kikan shido - between desks instruction. It's a universal phenomenon. Possibly, only the Japanese have thought up a name for it, but that commitment that that teacher made to having a one-on-one conversation with every student in the room - if you've got a class of 25 and a 50 minute period, that's entirely realisable. You got a class of 45 - or, in the case of the Philippines, 60 to 80 students - this is simply not tenable. So there are constraints on the way in which pedagogies can arise that have dictated the sorts of things that we can do.

Now, in the international work that we've done we have purposefully studied competent teachers. What we mean by competent teachers are teachers that the local community have selected for us as competent by their standard. Now, this is extremely important because it means that competence then emerges as a finding of our study. What does competence look like in Germany? What does competence look like in Sweden? What does competence look like in China? It's not the same thing.

You find Chinese teachers saying one of the most important things you can do is to facilitate student fluency in the technical language of the subject. You're thinking, but they never talk to each other. The Chinese teacher crafts whole class discussion in which the students - because they can't volunteer an answer or ask a question - are invited by the teacher, in an orchestrated way, to have a rich, lively discussion in which the technical vocabulary of the subject is publicly rehearsed in a really clever way.

Until you see it in action, you don't realise that the seamless and clever nature by which this technical language is rehearsed in a Chinese classroom. We do it
differently because our classrooms afford different sorts of practice.

ELISABETH LOPEZ

On Up Close we're talking to Professor David Clarke of the International Centre for Classroom Research at the University of Melbourne. David, what have you been learning about girls' participation and interactions in science and maths learning, especially given the concern about girls in these subject areas?

DAVID CLARKE

I think what we're seeing in the recent student participation, in particularly more sophisticated maths subjects, is that where girls do participate in those subjects they perform extremely well, but there is a form of social sifting going on. We're certainly not looking at any difference in capability. We are looking at a socially engineered difference in participation.

Now, that's a different issue. It's an issue that need be addressed through motivation, through role modelling, through suitable examples that students would find appealing. I think we haven't succeeded in doing that as well with the girls as we might. We certainly have ample evidence that where girls are participant in either sophisticated mathematic subjects or in science, they perform at least as well, so this is not our issue.

In the classroom, when we're studying the types of activities that boys and girls engage in, once again, you see the performance of social norms, and that can be quite amusing. You'll see the insistence on the part of some of the girls that appropriate practice be engaged in.

ELISABETH LOPEZ

What does that mean exactly?

DAVID CLARKE

They - I'm not trying to stereotype anyone in this, but you see an insistence on social norms, right practice, an avoidance of argumentation, a dampening down of any aggression. I'm at risk here of over-generalising, but we can certainly say that we have examples of each of these. Now, without making any attempt at generalisation, it's fair to say that what we are seeing performed in the classroom is the performance of the social norms as they're perceived by the students, and as they've been modelled for them by their parents and by their peers.
Now, we've been studying very closely the way in which students interact collaboratively, and it's provided us with some real insight into just how complex those interactions are and, of course, you see these sorts of roles being performed in those interactions, so that, simultaneously, students that are engaged in solving, say, a complex mathematical problem in a group of, say, four students, are doing at least three things. They are simultaneously worrying about the maths. They're attending to do I know the relevant mathematics? What's the appropriate procedure here? Do you know it? Do you know it? They're pooling their collective knowledge of the basic mathematics. But they also have to attend to things like what is it that they actually want us to produce? What's an acceptable answer? What can we call upon? When can we ask the teacher for help? What resources can we call upon? We have an iPad here. Can we go to the internet? Now, there are all sorts of norms - and we would call these sociomathematical norms - that they're attending to in framing an acceptable solution.

The third level is the social level. Because they're in a situation in which they are interacting with their peers, there are expectations they have that everyone's going to pull their weight. Australian students certainly will make it quite explicit if someone is not pulling their weight. That's where you find most visibly the performance of gender based normative behaviour. It need not be something of concern, other than where it demonstrably impedes the effective learning of the students.

If a reluctance to engage in lively negotiation turned out to be a gender specific characteristic, then, of course, it would be a concern, but I don't think it is. I think what we need to do is to equip our teachers to recognise the three levels of interaction. That is to facilitate and scaffold the mathematical tools that the students are drawing on, to make sure that the students are conversant with the norms of the classroom, the expectations for what constitutes an appropriate answer and appropriate working, and to look for personal interactions, social interactions, that are either conducive to furthering the argumentation and conversation of the students, or likely to stifle it, or to result in the alienation or marginalisation of any particular student, and that need not be a gender based thing.

ELISABETH LOPEZ

So, David, obviously, you're getting an incredibly rich, vast depository of data, but how does that translate eventually into classroom practice?

DAVID CLARKE

One of our principal interests at the moment is what we're calling teacher learning. It may not be obvious, but like, I think, any professional, teachers learn through the practice of teaching. That learning's mediated by the things they attend to. Now, I think what our research is doing is it's generating a set of principles that can guide
One of our studies is focussing on what are those things that teachers attend to? Are there things that our research suggests they might more productively attend to? Then what would constitute an appropriate instructional response? Now, you can't frame that response if you're not attending to the critical incident.

So one way of translating this into practice is to start teachers engaging in conversation about those things they attend to and introducing into the conversation things that we would have research evidence that would suggest if you were to attend to that, first of all, you'd probably learn something extremely useful, and it would be something on which you could base effective practice. That's one particular one.

The other thing we've been looking at is the vocabulary available to teachers by which they reflect on their practice. This is a fascinating study. We're working across nine countries and we are constructing the lexicon of pedagogical terms that teachers are using in each of those countries to speak about their practice. The lexicons that are emerging are different in very interesting ways.

Think of it this way. If I walk into a classroom most of the things I see I'm oriented towards because I have a name for them. If I have no name I may not, in fact, see those things. What we're discovering is that different communities are naming different things in the classroom.

ELISABETH LOPEZ

Or not naming them.

DAVID CLARKE

Or not naming them. The way in which I would suggest we use this is to ask the question across these communities: are there commonalities of focus that seem so pervasive that they are worthy of drawing to the attention of teachers, and saying when you are reflecting on your practice - when you're engaged in your practice in the classroom - here is a hit list of those things to which you might attend for which you have an active vocabulary, and create situations in which teachers have the opportunity to speak, reflect, report, discuss these aspects of their practice. Now, it seems to us that putting together this notion of the pedagogical vocabulary of teachers and equipping teachers to have a more subtle, sophisticated and nuanced vocabulary that has previously been the case - put that together with the importance of teacher selective attention - use the vocabulary as a vehicle to inform their selective attention - and what you should get out of that is a more rapid improvement in practice.
ELISABETH LOPEZ

Do you have an example of, I suppose, a concept that might not translate between cultures because it's not explicitly named?

DAVID CLARKE

I do have one example, which emerged from my conversation with my Chinese colleagues. They were looking at the Chinese lexicon and trying to find equivalent English terms. There was one term - and I apologise to all those who speak fluent Chinese for my pronunciation - but there is the term Ke Tang Sheng Cheng. It refers to an event where the teacher makes instructional use of an unexpected occurrence. It is the most beautiful thing to have a name for.

ELISABETH LOPEZ

How many words in English did you just use to describe that?

DAVID CLARKE

Yes, exactly. Whereas as a Chinese teacher has at their disposal this particular term, which not only gives them the chance to recognise the occurrence of this event - that is the instructional use of an unexpected action - but it also means that you can ask yourself the question, did I make use of that? It becomes an object of reflection, so it's a very nice example, I think.

ELISABETH LOPEZ

Thanks very much for coming in, Professor David Clarke.

DAVID CLARKE

It's been a great joy. Thank you.

ELISABETH LOPEZ

We've been talking about the social foundations of learning in maths and science with Professor David Clarke, Director of the International Centre for Classroom Research at the University of Melbourne. You'll find details of David's publications on the Up Close website, together with a full transcript of this and all our other programs.
Up Close is a production of the University of Melbourne Australia, created by Eric van Bemmel and Kelvin Param. This episode was recorded on 18 November 2015 and was produced by Peter Clarke, with audio engineering by Gavin Nebauer.

I'm Elisabeth Lopez. Thanks for listening. I hope you can join us again soon.

[Music]

VOICEOVER

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